The Effect of Transportation Benefits on Health and Consumption Among the Elderly: Quasi-Experimental Evidence from Urban China

Junchao Zhang
Project Assistant Professor, Risk Analysis Research Center, ISM
zhang@ism.ac.jp

Research Question

- Free transportation, better health?

- If so, what is the mechanism that causes better health?

Identification Problem

- Endogeneity

$$Health_i = \alpha_0 + \alpha_1 Subsidy_i + \boldsymbol{X_i}'\alpha_2 + u_i$$

$Cov(Subsidy_i, u_i) = 0$ does not hold. The OLS is inconsistent and biased.

→ Ommited variable bias: Common confounders between subsidy participation and health.

→ Selection bias: Participants' self selection into treatment. Treatment status is not random assigned!

- Multi-colinerity (an example of US)

→ Full Retirement Age (65-66 as of 2015)

→ Eligible Age for Transit Subsidy (65)

→ Eligible Age for Medical Care (65)

Multiple aging benfits are given at a certain age simultaneously, which makes it almost impossible to clearly identify each policy's impact in a statistical way.

Data

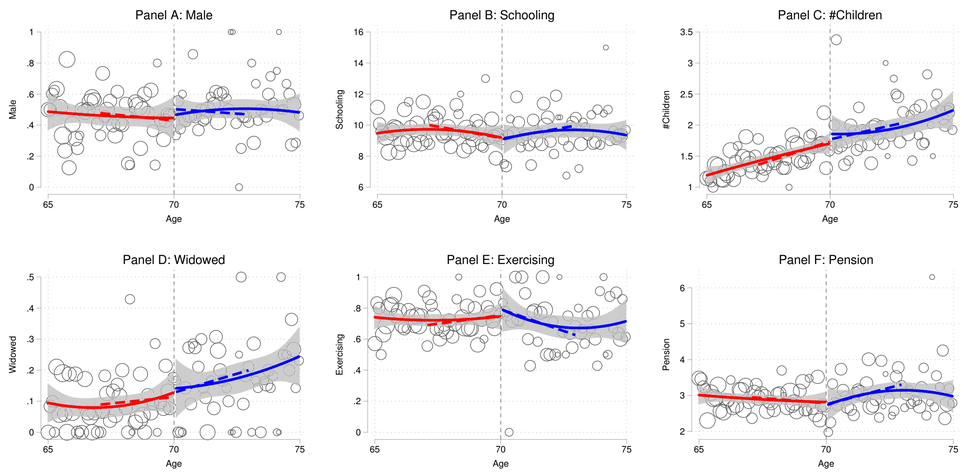
Chinese Living Conditions Survey for Rural and Urban Aged Population 2015

- Information on demographics, economic and health status, living conditions, social inclusion, routine activities, and social welfare is included.
- We use the Shanghai sub-sample that consists of 4,301 senior citizens in the most modern city in China, which is comparable to other global cities with respect to social security and welfare.
- To our knowledge, this is the first survey that includes questions on (1)transit subsidy participation, (2)health status, (3)detailed birth information, the last of which is necessary for parameter identification in an age-based policy evaluation.

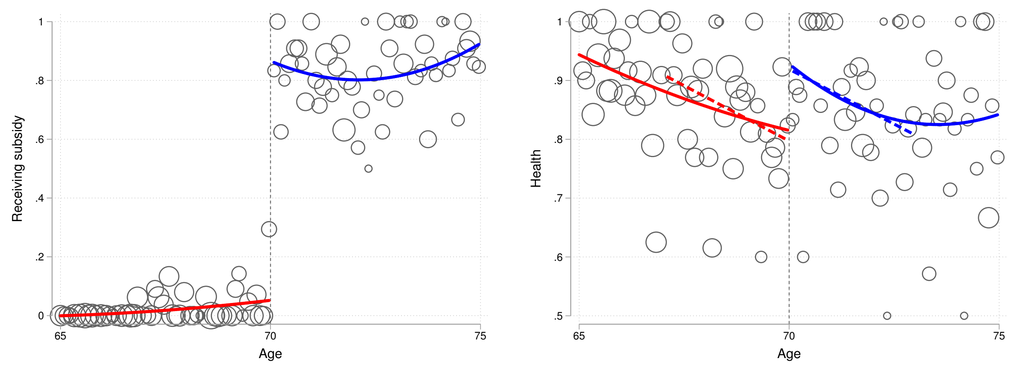
To investigate the effect of transportation benefits on senior citizens' health, we limit our sample to

- Elder people aged between 65-75 with a five-year bandwidth relative to age 70.
- Observations with no missing values in key variables.

Smoothness Tests



A Fuzzy Regression Discontinuity Design



Identification Strategy

- In Shanghai, China, elderly who are at least 70 are eligible for free transportation. We use the exogenous variations in subsidy participation probability induced by age to identify the health impact of free transportation.
- The benchmark model is defined as follows:

$$Health_i = \beta_0 + \beta_1 Subsidy_i + f(Age_i) + \boldsymbol{X_i}'\beta_2 + \epsilon_i$$

$$Subsidy_i = \gamma_0 + \gamma_1 \mathbb{1}[Age_i \geq 70] + f(Age_i) + \boldsymbol{X_i}'\gamma_2 + \varepsilon_i$$

→ where $Health_i$ indicates health status, $Subsidy_i$ indicates receiving transportation subsidy or not, $\boldsymbol{X_i}$ is a vector of individual characteristics.

→ the binary instrument $\mathbb{1}[Age_i \geq 70]$ indicates whether one's age is greater than or equal to age 70, $f(Age_i)$ is an unknown function of age. We assume a quadratic form of age to approximate $f(Age_i)$ as our baseline model.

Baseline Results on Health

		Quadratic Form			
	(1)	(2)	(3)	(4)	(5)
VARIABLES	OLS	IV	IV	IV	IV
Receiving subsidy	0.108***	0.104**	0.101**	0.102***	0.101**
	(0.026)	(0.042)	(0.041)	(0.040)	(0.040)
Basic controls	Yes	Yes	Yes	Yes	Yes
Marital status	Yes	No	Yes	Yes	Yes
Exercise	Yes	No	No	Yes	Yes
Pension	Yes	No	No	No	Yes
Observations	1,351	1,351	1,351	1,351	1,351
R-squared	0.049	0.026	0.027	0.049	0.049

Placebo Tests and Local Linear Regression

- Placebo Treatments

$$Health_i = \delta_0 + \delta_1 \mathbb{1}[Age_i \geq 70 \pm p] + f(Age_i) + \boldsymbol{X_i}'\delta_2 + v_i$$

- Local Linear Regression(Non-parametric way to approximate age function)

$$Health_i = \theta_0 + \theta_1 Subsidy_i + \theta_2 \widetilde{Age}_i + \theta_3 \mathbb{1}[Age_i \geq 70] * \widetilde{Age}_i + \boldsymbol{X_i}'\theta_4 + \phi_i$$

$$Subsidy_i = \rho_0 + \rho_1 \mathbb{1}[Age_i \geq 70] + \rho_2 \widetilde{Age}_i + \rho_3 \mathbb{1}[Age_i \geq 70] * \widetilde{Age}_i + \boldsymbol{X_i}'\rho_4 + \psi_i$$

- The baseline results are robust to different spec checks.

Mechanisms

Free transit improves health by approximately 10 percentage points.

1. Incidental physical exercise or routine activities(no effect)
   Should be very limited, at least not significant in statistics.
2. Health care utilization(+)
   People living close to the hospital (no more than two kilometers) will visit their doctors more frequently and thus spend more on health care. Free transit programs improve the elderly's access to hospitals.
3. Food consumption(+)
   Households with low food budgets substitute transportation consumption with more food. Free transit programs improve the elderly's access to markets.